comparative feebleness of the shower in this month. An observer, however, who extends his watch over a long period, if not over the whole of the night, will find little difficulty in mapping a sufficient number of Perseids to indicate a good radiant.

Bishopston, Bristol, June 10. W. F. DENNING.

Variations in Plants of the Herb Paris.

THE enclosed table, showing the variations in 200 plants of Herb Paris, picked this month in the woods near Wells, may be of interest to some of your readers, especially if looked at in connection with the memorandum written by Sir Edward Fry, which he is kind enough to allow me to send with it.

L. ELEANOR JEX-BLAKE.

HERB PARIS.

Plants	Leaves	Sepals	Petals	Stamens	Cells of Ovary	Styles
96 } normal flowers	4	4	4	8	4	4
44 } normal flowers	5	4	4	8	4	4
2 } normal flowers	6	4	4	8	4	4
13	5	5	4	9	4	4
8	5	4	4	9	4	4
5	4	4	4	9	4	4
2	4	4	3	8	4	4
2	4	4	4	8	4	5
2	5	5	5	10	5	5
2	5	5	4	10	4	4
2	5	4	3	7	3	3
2	6	4	4	10	4	4
2	7	4	4	9	4	4
1	3	4	4	9	4	4
1	3	4	3	8	5	5, and one rudimentary
1	4	4	3	8	4	5
1	4	5	3	9	4	4
1	4	5	4	9	4	4
1	4	4	4	10, one double	4	4
1	4	4	4	8	4	3
1	5	5	3	8	4	4
1	5	4	3	8	4	5
1	5	4	4	8, one double	4	4
1	5	4	4	8	3	2, and one rudimentary
1	6	4	4	9	4	4
1	6	6	4	8	4	4
1	6	5	3	8	3	3
1	6	5	4	9	5	5
1	6	5	4	9	4	4
1	6	4	3	9	4	4
1	5½	4½	3	8	4	4
	two halves grew together					

[Miss Jex-Blake's table seems to me to show many points of interest.

The Herb Paris has long been known to be very variable in the number of its parts; this table quantifies (I use the word, though it used to make a friend of mine very angry) the variability of the plant. It shows that, taking the 96 plants as exhibiting the normal form, more than one-half, *i.e.* 104 out of 200, vary from the standard; that the most variable element is the circle of stem leaves; and that looking at the flowers alone, 142 plants out of 200 are normal, 58 only abnormal; that the 58 thus varying plants fall into no less than 28 groups; that not only do the plants vary as wholes, but that parts usually the same in number, or multiples of the same number, do not maintain this relation, *e.g.* that in 13 plants you get 5 sepals, 4 petals and 9 stamens, and so on.

The plant being thus given over to variability and belonging to the great group of monocotyledons, in which 3 and multiples of 3 are the dominant number for the parts of the flower, a systematist might expect that the variations of the Herb Paris would oscillate round 3, or a multiple of 3, as the standard form; but, in fact, they oscillate round 4 as the dominant number, the 96 normal plants having that number, or a multiple of that number, everywhere, and 44 plants having that number and multiple everywhere except in the leaves. Nature, therefore, disappoints our reasonable expectation.

It has, I believe, been suggested that the flower of Herb Paris is ideally of 6 and 12 parts, and that it has been reduced to 4 and 8 parts by atrophy and suppression of 2 and 4 parts respectively. If this were a true theory, you would expect to find here and there a reversion to the ancestral form; but the table shows that the number 6 occurs in the floral parts once, and once only, viz. in the sepals, and the number 12 never occurs in the stamens or elsewhere, so that the suggestion of suppressed parts becomes highly improbable.

The Herb Paris wanders from the ordinary type of monocotyledons, not only in the number of the floral parts, but in having ramifying veins of the leaves in the place of parallel veins; there are other monocotyledons which have this variation in the leaf from the standard. Do they, too, show any tendency to vary in the number of the floral parts? or to put it in other words, is there any correlation of the two variations? I have not looked into the subject, but it might prove worth consideration.—E. F.]

May 25.

Quaternion Methods applied to Dynamics.

I SHALL be obliged if any of your readers can give me the titles of any works on statics, or dynamics, or any physical science which are based on Quarternion methods and use nothing but Quaternion symbols.

The end chapters of P. G. Tait's "Quaternions" give examples; Kelland and Tait work out the theory of strains using Quaternion methods, but neither of these suffice for the purpose I have in view, namely, to put into the hands of a student a text-book on dynamics, &c., written in Quaternion language.

Jubbelpore, June 1. W. G. BARNETT.

PLANT HYBRIDS.

HORTICULTURISTS have recognised that as time goes on they must look more and more to hybridisation for "new plants." Biologists are already pointing out that, if anything can, breeding experiments will add to our knowledge of "the species." For both of these reasons the current volume[1] of the Royal Horticultural Society's *Journal* is of very particular interest, seeing that it is in fact the detailed report of the Conference on Hybridisation and Cross-breeding held last summer. The present writer has already summarised in these pages[2] the chief facts of importance brought out in the two days' proceedings; but several of the papers have been elaborated and illustrated, while many further contributions have been sent in and are now published. The latter in particular call for further comment.

Speaking generally of the report, it may be said that it is of very great value as a record of parentage, as a storehouse of many facts, and as putting forth several interesting theories. Furthermore, among the contributors are amateur and professional horticulturists, scientific workers pure and simple, as well as men who combine the interests of both, and this is a decided step in the right direction. It is not to be expected that the collection of papers forms a complete treatise to guide the practical or theoretical student; useful points are only to be found among cases at present not to be reconciled together and along with striking differences of opinion.

The very discrepancies are, however, to be welcomed, for from them can be learned the work to which attention should be most ungrudgingly given in the future; and by the publication of the "Hybrid Conference Report" the Royal Horticultural Society will earn the gratitude of a larger circle than ever. In the present account it will be

[1] *Journ. R.H.S.* vol. xxiv. (April 1900), pp. 1–348; 123 Figs.
[2] NATURE, vol. lx. (No. 1552, July 27, 1899), pp. 305–307.

best to touch upon individual papers rather than to attempt to discuss them together under special headings, as was done before.

One must not pass over without mention the list of some hundreds of hybrid plants exhibited at Chiswick on the first day of the Conference. In this are given the names of the parent species and of the raisers, as well as notes as to characteristics and habits, and points in which the hybrids most resemble their father or their mother. The generic headings are arranged alphabetically, while several plants and the pitchers of some *Nepenthes* are figured. A page is further devoted to the interesting series of mixed grafts which were also shown. In these the branches of both scion and stock retain their foliage, and in all cases the component plants belong to different genera. The title of "Hybrid Grafts," given to them in the report, does not seem to be a satisfactory one, being open as it is to misinterpretation or to confusion with "graft hybrids."

Dr. Masters' introductory address has already appeared in NATURE (vol. lx. p. 286). Among Mr. Bateson's contentions as to the origin of species, which have not been previously alluded to, is his statement that most professed botanists and zoologists are agreed that no natural species, whether animal or plant, has arisen by direct hybridisation. This may be mentioned, as another contributor to the report expresses the opposite opinion. Furthermore, Mr. Bateson's remarks as to the benefits that many horticulturists might confer upon the student of evolution, by recording even rough statistics, are very much to the point.

The genus Anthurium.—M. de la Devansaye says: (1) that in this genus, pollen to be of value must come from plants springing from a different batch of seeds from that giving rise to the ovule-bearing individuals; (2) that pollen from allied genera has a beneficial effect; (3) that variations may not be seen in the first or second generation of hybrids, and yet may appear in the third or fourth. Hence experiments should not be abandoned too soon.

Monstrosities.—Prof. Hugo de Vries' paper, read under the title of "Hybridisation as a means of Pangenetic Injection," now appears as "Hybridisation of Monstrosities." There is plenty in it, however, which does not refer to monstrous plants. Variation among hybrids of the first generation, as regards the colour of the flower, in a case considered by the professor, is put down by him as justifying the supposition that they simply inherited their variability from their mother. He lays down as a rule of horticultural practice the choosing of forms to hybridise, of which at least one is known to be very variable. The well-known multiformity of hybrids is stated to arise from this, but the fact—abundantly proved by the Conference—is also noted, that many hybrids can hardly be distinguished exteriorly from one or other of their parents, and therefore may be often mistaken for true species.

Hybridisation and its Failures.—Physiological affinity, says Prof. Henslow, it would seem, must be neglected altogether in purely systematic work. He gives many cases where plants that botanically are placed in separate genera or families, on the strength of a single character, will not breed together, and he contends that genera that can be crossed should not be united for this reason alone, for if interbreeding is to be the test, polymorphic forms of the same species would logically have to be separated. The many "failures" recorded by Prof. Henslow must not be all put down as definitely proved to be such, as in many cases adverse conditions, of which the experimenters were ignorant, may have prevailed.

One would be interested to know whether the professor gained much information from the answers to the question set by him at the Royal Horticultural Society's examination last year, which ran, "Give any instances of failures, and state your opinion as to their causes, in crossing distinct species."

FIG. 1.—True and false hybrids of *C. trus*

Official Work of the United States.—In the previous notice were mentioned the difficulties met with by Mr. Webber and Mr. Swingle, owing to the ovule of *Citrus* producing more than one embryo. In the accompanying illustration (Fig. 1), reproduced from the report by the courtesy of the Royal Horticultural Society, pots 1 and 4 each contain two seedlings of *Citrus trifoliata* type, arising from a single seed, and which show no effects of any cross. In the second pot are three young plants, again rising from a single seed, as determined after it had germinated. The seed was the result of a cross between *C. trifoliata*, ♂, and the Tangerine orange, ♀. One of the seedlings has trifoliate leaves of larger size than the typical *C. trifoliata*, and this is the true hybrid from the egg-cell proper, while the other plantlets with unifoliate leaves, and resembling the Tangerine, are from adventive embryos.

In No. 3, where the parents of the seed were the sweet orange, ♂, and *C. trifoliata*, ♀, two seedlings have grown both with trifoliate leaves, and that having these larger and more abundant may be put down as the hybrid. The

other, which is like the mother in every respect, is looked upon as the product of the nucellus. Mr. Webber's other remarks and illustrations apply to the hybridisation of cotton and maize.

The Structure of Certain Hybrids.—Dr. Wilson contents himself chiefly with the external structure of hybrid *Passiflora*, *Albuca*, *Ribes* and *Begonia*. His figures bring out very forcibly the intermediate nature of many hybrids. The grades between ideal "tuberous" and "non-tuberous" conditions in hybrid *Begonia* are remarkable, joints of the stem falling away in several instances. We reproduce his illustration (Fig. 2), a

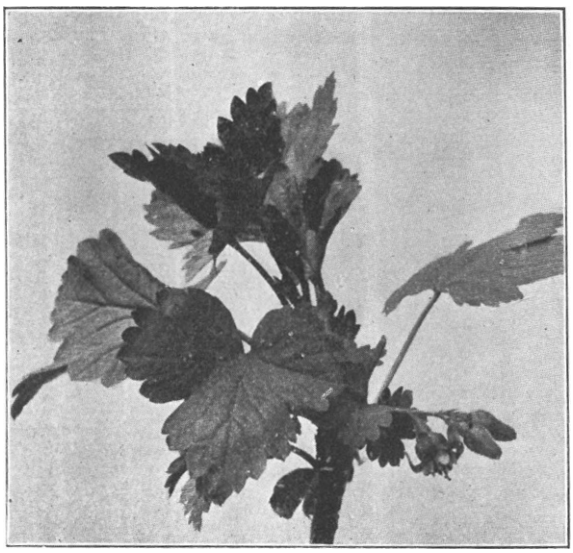

FIG. 2.—Flowering shoot of *Ribes nigrum*, ♀, × *R. grossularia*, ♂, (nat. size).

flowering shoot of a hybrid between the gooseberry, ♂, and black currant, ♀, and his sections of the ovary walls of the young plant and its two parents (Figs. 3, 4, 5). Several experimenters have obtained the cross and fruit from it, but no seeds. It is interesting that no odour of the black currant is possessed by the leaves, and that the caterpillars of the gooseberry saw-fly attack them without hesitation.

Self-sterility.—It is well that the importance of determining whether a plant may not be self-sterile has been

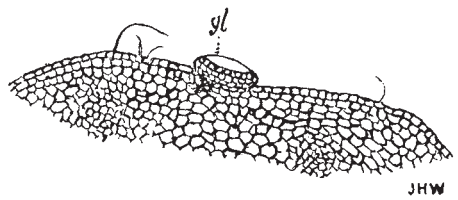

FIG. 3.—Transverse section of part of the ovarian wall of the black currant.

brought out by Dr. F. Ludwig. All the individuals of a species which is propagated vegetatively may, in a particular neighbourhood, be practically the same plant, and incapable of fertilising one another (compare the case of *Crocus sativus* on p. 276). Hence the importance in bringing pollen from physiologically independent individuals at a distance, mentioned in the discussion by the Rev. G. H. Engleheart with regard to daffodils, but not explained by him. Among a series of his opinions summarised conveniently by Dr. Ludwig is one with regard to the springing up of races within the same species, which may be self-sterile and self-fertile. Another is of a very practical nature, and deals with the advisability, when introducing a new species of plant into a garden, to obtain at least two examples of it of as different origin as possible, or to procure the seed of such.

Work at the Paris Natural History Museum, 1887–99.—M. L. Henry contributes a list of plants supposed to be hybrids, which he suggests might have their origin

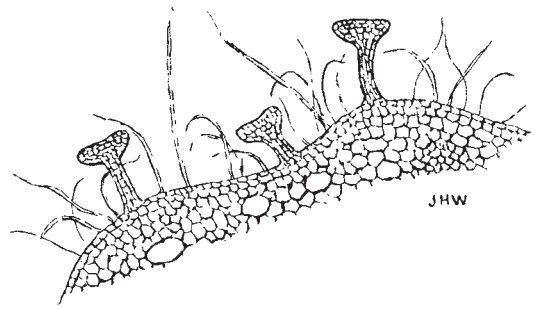

FIG. 4.—Transverse section of part of the ovarian wall of the hybrid.

proved by hybridisation experiments. He adds a record of his work during recent years, giving most details with regard to lilacs.

Graft Hybrids.—This account of the Bronvaux medlar, by M. E. Jouin, appeared originally in *Le Jardin* (January 20, 1899); and M. Daniel ("La Variation dans la Greffe," *An. Sci. Nat. Bot.* Series 8, vol. viii. (1898), pp. 1–226; pls. i.–x.) has figured and given some details in

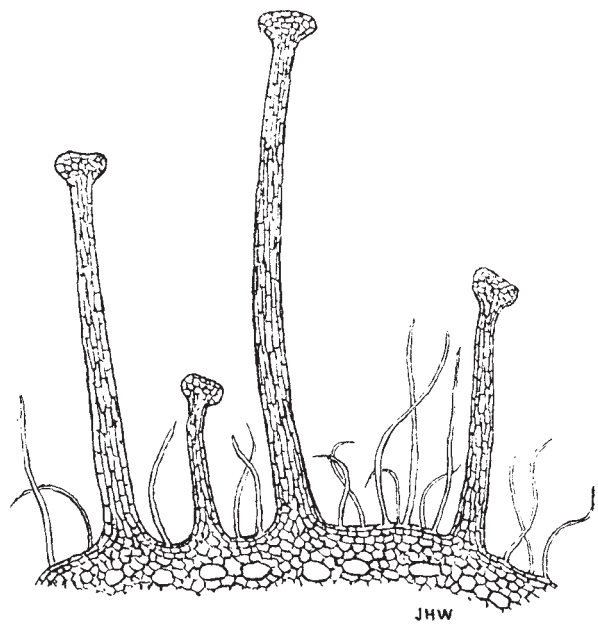

FIG. 5.—Transverse section of part of the ovarian wall of the gooseberry.

his recent paper of the remarkable branches pushed out by the whitethorn stock below the graft.

Branch No. 1 is intermediate between the whitethorn and medlar. It is, however, thorny, and bears corymbs of as many as twelve flowers, instead of solitary blossoms. The fruits are medlars, but small and much flattened.

Branch No. 2.—The young leaves resemble those of the whitethorn; the older, those of the medlar, being hardly, or not at all, lobed. The flowers are like those of

the former plant, and arranged in corymbs, but a trifle larger. The fruits are not medlars.

Branch No. 3.—The base is simply whitethorn, but the extremity is practically like Branch No. 2.

Similar cases are instanced by M. Jouin, who puts down the now celebrated *Cytisus adami* as having arisen in the way that the branches above described have done.

Drosera Hybrids.—This paper, by Prof. Macfarlane, has already appeared in the publications of the University of Pennsylvania; it deals with the structure of a batch of natural hybrids. It may be noted that several instances of what the author has called bi-sexual hybridity occur in the plants considered (p. 248); for instance, instead of finding structures intermediate between the elongated glandular hairs of *Drosera filiformis* and the sessile two-celled glands of *D. intermedia*, both appear on the calyx of the hybrid between them. This fact calls forth some interesting speculations of a cytological nature, which the Professor hopes to see verified. As showing the growing opinion in favour of graft hybrids being realities, it might be mentioned that *Cytisus adami* is referred to as such in the paper.

The Influence of each Parent.—From experiments with cereals and Bromeliaceæ, Dr. Wittmack concludes that "the mother has the more influence upon the habit; the father the more upon the inflorescence; at least, upon its colour." The contrary opinion of M. Duval is given, who also holds that to reduce the volume of the plant the larger must be fertilised by the small parent species. According to Mr. Tropp, the same holds good usually, but not always, with orchids.

Principles.—The laws given by Herr Max Leichtlin may be quoted in full:—

(1) The female parent gives to the offspring the form and shape of the flowers; also certain qualities.

(2) The male parent gives more or less of the colouring of the flowers, and if it be richer and blooms more freely than the female, this property is transferred to the offspring.

(3) Artificially produced offspring give larger flowers than either of their parents.

(4) The more distant the habitats of the species intended to hybridise, the more difficult is it for them to be fertilised with each other's pollen.

(5) The offspring becomes infertile and delicate if the form of the flowers of their parents is widely different in shape and outline.

Breeding Staple Food Plants.—In alluding to the cost in labour and money of developing hybrids when the immense number of plants that should be dealt with are used, Prof. Willett Hays points to the importance of selecting carefully the parental individuals. The best flower, he says, too, should be chosen from the best part of the plant.

An Improved Variety of Crocus Sativus.—It was not till after many experiments with examples from many places that the saffron could be got to produce seed, except very meagrely (compare the remarks already made on self-sterilising above). After a wild plant of *Crocus graecus* was obtained from the island of Syra, as much seed as was wanted was obtained. In the variety produced by M. Chappellier there is a proliferation of stigmas, sometimes thirty, and even bracts and sheaths have been converted into them.

Experiments with Dioscorea.—In an attempt to obtain a tuber which was short enough for one to dig up easily, a plant was obtained by M. Chappellier bearing both male and female flowers. This worker also contributes a note on *Mirabilis*.

Hybrid Lilacs.—M. E. Lemoine sends an account of how he proved the Varin lilac to be a hybrid between *Syringa persica laciniata* and *S. vulgaris*, a piece of work which M. Henry would also have succeeded in if his plants had not died before flowering.

Hybrid Clematis are dealt with by M. Morel and Mr. Jackman. M. Duval treats of *Anthurium scherzerianum*, of Bromeliads and of Gloxinias. This hybridist points out how important it is to know the pedigree of plants experimented with, and says that the male parent should be most carefully selected, as being the one whose influence greatly preponderates. Mr. Meehan and Mr. Smythe have written a few general notes. Mr. Weekes has a little to say about Chrysanthemums, while Mr. James Lye, when discussing the cross-fertilisation of the *Fuchsia*, states that he uses the tip of a squirrel's tail to transfer the pollen, and prefers muslin bags to those made of paper for enclosing the chosen blossoms.

Mr. Wilks, the secretary of the Royal Horticultural Society, must be complimented upon the successful production of the report. WILFRED MARK WEBB.

OUR NORTHERN BIRDS.[1]

MR. DIXON is a prolific writer, and confines himself almost entirely to one subject. Nevertheless he always succeeds in interesting his readers, and contrives to say something fresh even upon such a trite and thread-

FIG. 1.—Rough-legged Buzzard (From Dixon's "Among the Birds in Northern Shires.")

bare theme as British birds. In a former volume Mr. Dixon took as his subject "Bird-life in a Southern County"; and in the present work he dwells on the great difference between the bird-fauna of the more northern counties of England and Scotland from that of the south

1 "Among the Birds in Northern Shires." By Charles Dixon. Pp. x + 303. (London and Glasgow: Blackie and Son, 1900.)